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REMOTE INSTALLATION OF COMPUTER OPERATING SYSTEMS

Abstract:

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(57) Abstract: The invention includes a method of installing a computer operating system from a network to a computer and configuring the computer for use on the network or on another network. An installation routine is run which accepts an input of a build location and a delivery location, interrogates an environment database with the build location and the delivery location to obtain one or more build specific variables and one or more delivery specific variables. The installation routine also determines the computer type and installed hardware components, accesses the network using the build specific variables, and copies a master installation script from an operating system installation source stored on the network. Still further, the installation routine modifies the copied installation script in dependence on the build specific variables, delivery specific variables, detected computer type and hardware components to create a dedicated installation script. The computer operating system is subsequently automatically installed using the dedicated installation script. The installation process may also include the step of registering the computer with the network where it is to be used upon so that it is ready for immediate use at the delivery location.

## REMOTE INSTALLATION OF COMPUTER OPERATING SYSTEMS

### 5    **Field of the Invention**

The present invention relates to the remote installation of computer operating systems for networked computers.

### **Background to the Invention**

10    It has become common in business organisations to connect computers together by cabling in a network so that resources such as printers and files may be shared and also to permit the use of facilities such as electronic mail, the Internet and company intranets. Such networks may be in the form of a local area network (LAN) where computer workstations in a single physical location, for example a building, are connected to each other and to a computer acting  
15    as a network server. The network server typically controls security access to the network and regulates resource sharing. There may be more than one network server on a LAN, for example each floor of the building may have its own dedicated server.

With the advent of cheap, high capacity, telecommunications it has become possible to  
20    connect individual LANs together to form wide area networks (WANs). This interconnection permits large scale resource sharing and is the basis of the Internet. Large organisations use such technology to form their own intranets allowing secure organisation-wide e-mail and file sharing.

25    In large LANs or WANs, with hundreds or even thousands of computer workstations and many servers, administration or management of the individual computer workstations can be a cumbersome task. Manual installation of each computer workstation is a laborious and time consuming task, often taking several hours to complete. During the installation and configuration of a computer operating system, the installer must select the configuration and  
30    the software components to be installed that conforms to the machine, the organisation-wide policy, the LAN requirements and the end user requirements. This can mean that the

configuration of computers across WANs will vary significantly and even the configuration of computers across the same LAN may be different. Each system administrator must be familiar with each differing configuration on any LAN or WAN they are expected to support as each configuration may raise its own support issues and possible conflicts with policy. In  
5 response to this, many organisations now have organisation-wide policies which define the software and hardware configuration of each computer workstation in an attempt to produce standardised configurations and thereby ease these support problems.

It is now possible to install computer operating systems from a data store on a network to a  
10 particular computer workstation. This can be achieved using pre-written scripts setting installation and configuration options to facilitate automatic installation. However, these scripts can generally only be used for the standardized installation of an operating system from a LAN with a single server.

15 As has been discussed above, in many organisations, there is no "standard" computer configuration. One user, or a group of users, may require a computer configuration with video conferencing capabilities, another may require a lightweight computer configuration for working out of the office, whilst clerical staff are only likely to require a basic computer configuration with access to network resources. It may be possible to supply a "standard"  
20 computer configuration and add the necessary hardware components to satisfy users, but with computer components becoming out of date almost as soon as they are released, operating systems do not normally have the software to support the newest hardware and therefore supporting automatic installation of operating systems on varying types of computer configurations is very problematic. Indeed, many new computer hardware components are  
25 not directly supported by current operating systems and additional support software provided by the computer component's manufacturer must be installed during the installation of the operating system in order for the hardware components to operate properly.

### **Summary of the Invention**

30 According to a first aspect of the present invention, there is provided a method of installing a computer operating system, comprising the steps of running an installation routine on a

computer in which the installation routine accepts user inputs defining a delivery location and is operative to detect the computer type, connect the computer to an operating system installation source held on a remote computer, retrieve a copy of a master installation script held on the remote computer, and modify the copied master installation script in dependence  
5 on a number of variables associated with the delivery location and the computer type to create a dedicated installation script, and subsequently installing automatically the computer operating system using the dedicated installation script.

Preferably, the installation routine is operative to retrieve additional software associated with  
10 the computer type from the remote computer and subsequently install the software using the dedicated installation script.

Preferably, the installation routine is operative to detect hardware components of the computer, to retrieve additional software associated with the hardware components to  
15 supplement the computer operating system from the remote computer and subsequently install the software using the dedicated installation script.

Preferably, the installation routine is operative to detect the computer type and the hardware components of the computer by evaluating the computer's BIOS settings. Preferably, the  
20 installation routine evaluates the computer's BIOS settings by comparing the computer's BIOS settings with known BIOS settings. The storage device may hold a database containing the known BIOS settings, each of which BIOS settings being associated with one or more hardware variables, whereby the hardware variables may be used to modify the master installation script. The hardware variables may be used to modify the master installation  
25 script to thereby install additional software for undetectable hardware components known to be present in computers having a certain type or hardware component. The hardware variables may be used to modify the master installation script to thereby change programmable settings of the computer or hardware component.

30 To save the system administrator and computer workstation having to be at the physical location where the computer workstation is to be used, it is desirable that an operating system

can be installed and configured elsewhere, such as at the equipment supplier's premises or at a centralised IT/support centre, the installation possibly being performed in a different language to that required by the end user and possibly without a network connection to the LAN and server where the computer workstation is to be used. It is furthermore desirable that  
5 a computer installed and configured at a first location for use at a second location will be configured exactly the same as a computer installed and configured at a third location for use at the second location.

In order to cater for installing to different computer configurations and also to be able to  
10 automate the installation of operating systems supporting hardware that post dates the release of the operating system, it is very desirable that the computer type and configuration can be automatically detected so that appropriate additional software can be installed to supplement the operating system.

15 The present invention provides an installation procedure in which the installation and configuration of each workstation is standardised and repeatable. The present invention also provides an installation procedure in which the installation process is essentially automated, thereby reducing the amount of time an installer must spend at each machine to provide a machine ready to be used upon delivery. Furthermore, the present invention provides an  
20 installation method and system where a computer operating system can be installed and configured at a first location for use at a second location, where the second location need not necessarily be on the same LAN or WAN as the first location. Most advantageously, the present invention provides an installation procedure which is adaptive, selecting the additional software needed to support non-standard configurations without prompting the user.

25 Preferably, the installation routine is operative to retrieve the computer operating system from the remote computer along with any additional software and subsequently disconnect the computer from the remote computer, wherein the computer is then re-booted and the computer operating system installed using the dedicated installation script. The installation routine may  
30 also accept user inputs defining a build location corresponding to the location of the remote computer where the operating system installation source is held.

The data connection to the remote computer may be made via the internet.

Preferably, the storage device is a computer disk. However, it may be any computer readable  
5 media capable of storing the aforementioned instructions.

According to a second aspect of the present invention, there is provided a system for installing  
a computer operating system comprising: a computer; a network to which the computer may  
be connected; a remote computer connected to the network which holds an operating system  
10 installation source, additional software and a master installation script file; and, a storage  
device which holds a set of computer executable instructions and a number of files for  
performing an installation routine in accordance with the first aspect of the present invention  
when run on the computer.

15 According to a third aspect of the present invention, there is provided a program storage  
device readable by a machine and encoding a program of instructions and a number of files  
for executing the method of the first aspect of the present invention.

Preferably, the machine is a general purpose computer.

20

The installation routine may be initiated by running a computer program held on a storage  
device. Preferably, the storage device is a computer disk which is inserted into a drive of the  
computer. The computer may connect to the remote computer by the internet. The additional  
software may be located on a different source to that of the remote computer.

25

### **Brief Description of the Drawings**

Examples of the present invention will now be described in detail with reference to the  
accompanying drawings, in which:

30 Figure 1 is a schematic of a typical computer hardware arrangement used in the remote  
installation of a computer operating system in accordance with the present invention;

Figure 2 is a flow chart which outlines a typical installation routine according to the present invention;

5 Figure 3 is a flow chart expanding upon a particular step of the installation routine illustrated in Figure 2;

Figure 4 is an expanded schematic of the hardware arrangement shown in Figure 1 including an end-use network where a workstation is to be used;

10

Figure 5 is a flow chart of a more specific example of an installation routine according to the present invention; and,

15 Figure 6 is a flow chart expanding upon a particular step of the installation routine illustrated in Figure 5.

### **Detailed Description**

A typical arrangement of the computer hardware used in the remote installation of a computer operating system in accordance with the present invention is shown in Figure 1. A network  
20 10 connects a network server 12 and a network data store 14 to a network interface device 16. The network interface device 16 is connected to a computer workstation 18 with a random access disk memory 20. For a brand-new machine the disk memory 20 does not contain a computer operating system.

25 In the present invention, a 32 inch disk or other suitable storage device 22 is used to boot the computer workstation 18. During the boot, an installation program held on the computer storage device 22 is run on the computer workstation 18. As will be described in detail below, when running an installation routine controlled by the software the installer is prompted to identify the particular network interface device 16 and to input a build location code, a  
30 delivery location code and a unique identifier for the computer workstation 18. Subsequently, the installation routine detects the computer type of the computer workstation 18 and its



additional hardware components. By using the data input by the installer, the installation routine is able to connect the computer workstation 18 to the network 10 via the network interface device 16. The installation routine then automatically installs an appropriate computer operating system from a remote computer operating system installation source held  
5 in the network data store 14 onto the disk memory 20 of the computer workstation 18. As will be described below, the installation routine is adapted to configure the computer operating system in dependence on the delivery location code and detected computer type and hardware components. The build location code refers to where the build process is to be carried out, whilst the delivery location code refers to where the built computer workstation is to be  
10 located.

An overview of the installation routine will now be described with reference to the flow chart of Figure 2. As indicated, having inserted the installation disk and switched the computer workstation on, the installer is prompted to input a build location code and a delivery location  
15 code in step 100. An environment database in a look-up table stored on the installation disk is then interrogated with the build location code and the delivery location code (step 102) to obtain build location specific variables and delivery location specific variables which are stored by the computer workstation in step 104. The installer is also prompted to enter a unique identifier for the computer workstation (step 106). The installation routine then scans  
20 the computer workstation's BIOS settings in step 107 to determine the computer type (including manufacturer and model) and hardware components, such as PCI devices, installed in the computer workstation. The detected computer type and hardware components are cross referenced with a further look-up table held on the installation disk to determine computer workstation variables in step 107a. Using the build location specific variables the installation  
25 routine connects the computer workstation to the network in step 108 and accesses an installation account on the server. A master installation script held with the computer operating system installation source on the network data store is copied onto the disk memory of the computer workstation in step 110. The copy of the installation script is then modified in dependence on the build location specific variables, on the delivery location specific  
30 variables and on the computer workstation variables (step 112) to create a dedicated installation script. The computer operating system is then installed and configured using the

computer operating system installation source setup routine with the dedicated installation script in step 114.

The installation and configuration step 114 of Figure 2 is expanded upon in the flow chart of Figure 3. As shown, the computer operating system installation source is copied from the network data store onto the disk memory (such as a hard disk) of the computer workstation in step 200. Additional software required by the detected computer type or detected hardware components, as defined by the computer workstation variables, is copied from the network data store in step 201. The setup routine then disconnects from the network and reboots the computer workstation in step 202. After the reboot of the computer workstation, the setup routine installs the computer operating system using the dedicated installation script (step 204). The additional software is then installed to supplement the computer operating system in step 205. The computer operating system is then configured in dependence upon the dedicated installation script in step 206. Any additional software components such as e-mail and office application suites specified in the installation script are installed from the network data store at this time (step 208). The setup routine also cleans up the disk memory of the computer workstation by deleting any unnecessary files in step 210. The setup routine ends once the computer workstation has a complete computer operating system ready for use at the delivery location.

20

The schematic of Figure 4 includes the computer hardware arrangement of Figure 1 in addition to a network 30 and a network server 32 to which the computer workstation 18 is intended to be connected. The network 10 may be a part of the same LAN as the network 30, it may be a part of the same WAN as the network 30 connected by a telecommunications system, or there may be no network connection to the network 30. If there is a connection between the network 10 and the network 30 that the computer workstation 18 is intended to be used upon, then the installation routine registers the computer workstation 18 by its unique identifier with the network 30 and network server 32 where the computer workstation 18 is to be used. If there is no connection to the network 30 that the computer workstation 18 is intended to be used upon the registration is re-run when the computer is first started at the delivery location.

30

A more specific example of the present invention will now be described with reference to Figures 4 and 5. In this example, the network 10 is an Ethernet network, with network servers 12, 32 operating under Microsoft Windows NT Server operating system V.4 and the computer  
5 operating system installation source is Microsoft Windows NT workstation. The computer storage device 22 is an MS-DOS formatted disk holding an MS-DOS v.6.22 operating system kernel and files necessary to boot the computer workstation 18, the installation routine, the environment database and TCP/IP network drivers for each selectable network interface device 16. The computer workstation 18 is a Hewlett-Packard Vectra XM/4 5/166 Personal  
10 Computer with 32MB of random access memory. The disk memory 20 of the computer workstation is a 1.2GB hard disk drive. The network interface device 16 is a 3COM Etherlink 2 3C503/16 Ethernet network card installed in the computer workstation 18.

When the computer workstation 18 is booted with the computer storage device 22 inserted in  
15 the computer's disk drive, the operating system kernel on the computer storage device 22 takes control of the boot routine and prompts the user to select the network interface device 16 used from a list of supported network interface devices using the MS-DOS v.6.22 start-up menu facility in step 300. The TCP/IP network drivers corresponding to a network interface device selected from the list are copied to default file names (step 302) so that the installation routine  
20 may access any of the supported network interface devices without knowledge of the specific type. The boot routine then runs the installation routine in step 304. The installation routine accepts an input of a build location code (step 305) and a delivery location code (step 306). The build location code and delivery location code are cross-referenced with a list of allowable locations in respective steps 307, 308 and if the locations are not on the list, a list  
25 of the allowable locations is displayed in respective steps 309, 310 and the installer is prompted to re-enter the code in respective steps 305, 306. If six incorrect attempts at entering an allowable location are made the installation routine ends and reports an error in respective steps 309a and 310a. After a valid build location code and a valid delivery location code are entered, the installation routine accepts an input of a unique identifier for the computer  
30 workstation (step 311) to be later used as its DNS address. The installation routine interrogates the environment database with the build location code and the delivery location code in step

312 to obtain build location specific variables and delivery location specific variables. The variables relate to environment and network specific settings for the two locations, as can be seen from Table 1.

5

Code	Location	Server	Share	File System	Keyboard Layout	Logon Domain	Join Domain	Time zone
CR	Crewe	UK_CRID	ID4	NTFS	UK	UK_G	UK_C	GMT
GR	Greenford	UK_ID	ID4	NTFS	UK	UK_G	UK_I	GMT
REM	Remote Build Site	UKGW	ID4	NTFS	UK	UK_REM	UK_REM	GMT
UK	GW UK at Stockley	UK_ID4	ID4	NTFS	UK	UK_G	UK_I	GMT
UK_I	GW UK Backup at Stockley	UKB_ID4	ID4	NTFS	UK	UKB_G	UKB_I	GMT
US	US RTP Primary	US0001	ID4	NTFS	US	US1	US_D	GMT-5

Table 1

The build location specific variables "server" and "share" define the server and network data store holding the computer operating system installation source. If, for example, the build location UK is entered, the computer operating system installation source would be installed from ID4 on the UK\_ID4 server.

Once the build and delivery locations have been set, the installation routine accesses the computer workstation's BIOS (Basic Input Output System) in step 312a which holds data on the computer workstation's hardware (manufacturer, model, memory, hard disk capacity, Advanced Power Management support and settings and other hardware components such as MPEG, USB, Firewire, parallel and serial interfaces). An example of data held in a computer workstation's BIOS is shown below:

```

5  F000:0000 26 89 45 1C 8B C6 03 C3 83 C0 48 26 89 45 1A 32 &.E.....H&.E.2
   F000:0010 E4 1F C3 E8 01 00 CB 1E 8B 36 C4 00 0B F6 74 30 .....6....t0
   F000:5030 03 50 00 00 B9 0F 00 FC F3 67 A4 59 66 5F 07 66 .P.....g.Yf_.f
   F000:5040 5E 1F C3 19 50 68 6F 65 6E 69 78 20 54 65 63 68 ^...Phoenix.Tech
   F000:5050 6E 6F 6C 6F 67 69 65 73 20 4C 74 64 2E 00 00 48 nologies.Ltd...H
   F000:5060 43 2E 31 31 2E 30 39 55 53 00 58 58 58 00 19 48 C.11.09US.XXX..H
   F000:5070 65 77 6C 65 74 74 2D 50 61 63 6B 61 72 64 00 FF ewlett-Packard..
10 F000:5080 FF FF FF FF FF FF FF FF 00 19 48 50 20 4B 61 79 .....HP.Kay
   F000:5090 61 6B 20 50 43 20 57 6F 72 6B 73 74 61 74 69 6F ak.PC.Workstatio
   F000:50A0 6E 00 FF 00 19 58 41 20 36 2F 32 36 36 00 69 FF n. ..XA.6/266.i.
   F000:50B0 FF FF FF FF FF FF FF FF FF FF FF FF FF FF 00 19 .....
15 F000:50C0 46 52 37 34 31 37 38 39 30 39 00 DD FF FF FF FF FR74178909.....

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### Computer Workstation BIOS example 1

The installation routine cross-references the contents of the computer workstation's BIOS with a BIOS settings table held on the installation disk in step 312b. The BIOS settings

20 table stores the BIOS codes that will be found in the BIOS of each computer workstation from a particular manufacturer, such as the "Hewlett-Packard" identifier in the above example. A subset of entries are stored in the table for each manufacturer identifying the BIOS codes that will be found in each particular computer workstation model supplied by that manufacturer, such as "HP.Kayak.PC.Workstation XA 6/266" in the above example.

25 For each computer workstation model supplied by a manufacturer, a unique workstation type code is stored in the table. By cross-referencing the contents of the BIOS with entries in the table, a unique workstation type code is determined.

The BIOS also holds data on other hardware components attached to the computer

30 workstation's bus such as PCI cards and USB devices. An example of data held on PCI components by a computer workstation's BIOS is shown below:

```

5  PCI bus 00 device 00 function 00: Header Type 'non-bridge' (single-func)
   (Vendor 8086)                      ° Class 06: bridge          I/F: 00
   (DeviceID 7180)                    ° SubCl 00: CPU/PCI          Rev: 03
-----
10 PCI bus 00 device 01 function 00: Header Type 'PCI-PCI bridge' (single-func)
   (Vendor 8086)                      ° Class 06: bridge          I/F: 00
   (DeviceID 7181)                    ° SubCl 04: PCI/PCI          Rev: 03
-----
15 PCI bus 00 device 04 function 00: Header Type 'non-bridge' (multi-func)
   (Vendor 8086)                      ° Class 06: bridge          I/F: 00
   (DeviceID 7110)                    ° SubCl 01: PCI/ISA          Rev: 01
-----
20 PCI bus 00 device 04 function 01: Header Type 'non-bridge' (single-func)
   (Vendor 8086)                      ° Class 01: disk           I/F: 80
   (DeviceID 7111)                    ° SubCl 01: IDE            Rev: 01
-----
25 PCI bus 00 device 06 function 00: Header Type 'non-bridge' (single-func)
   (Vendor 10B7)                      ° Class 02: network        I/F: 00
   (DeviceID 9001)                    ° SubCl 00: Ethernet       Rev: 00
-----
PCI bus 01 device 00 function 00: Header Type 'non-bridge' (single-func)
   (Vendor 1013)                      ° Class 03: display        I/F: 00
   (DeviceID 00D6)                    ° SubCl 00: VGA            Rev: 03

```

### Computer Workstation BIOS example 2

The BIOS settings table also holds entries for each supported component, cross-referencing  
 30 each component with a unique component code. Each entry in the computer workstation's  
 BIOS is cross-referenced with the entries in the BIOS settings table to determine unique  
 component codes.

Using the build location specific and delivery location specific variables in combination with  
 35 the TCP/IP drivers and the unique identifier, the installation routine logs the computer  
 workstation onto the network in step 313. The IP address for the computer is obtained from  
 the server using DHCP (dynamic host configuration protocol) and the unique identifier is used  
 as the DNS address. A computer disk format utility is run to format the disk memory 20 of the  
 computer workstation 18. A master installation script stored on the network data store with  
 40 the computer operating system software source is copied onto the disk memory (step 314). An  
 example of a master installation script is shown below:

[Unattended]  
OemPreinstall = yes  
OemSkipEula = yes  
NoWaitAfterTextMode = 1  
5 NoWaitAfterGUIMode = 1  
**FileSystem =**  
ExtendOEMPartition = 1,nowait  
ConfirmHardware = no  
NtUpgrade = no  
10 Win31Upgrade = no  
TargetPath = WINNT  
OverwriteOemFilesOnUpgrade = no  
**KeyboardLayout =**  
  
15 [GUITUnattended]  
**TimeZone =**  
  
[OEM Ads]  
Banner := "Glaxo Wellcome, GIS ID4 v3.0 Installation.\*Windows NT v4.0 Workstation."  
20 Background = gis.bmp  
  
[UserData]  
FullName = "Glaxo Wellcome"  
OrgName = "Glaxo Wellcome"  
25 **ComputerName =**  
  
[Display]  
ConfigureAtLogon = 0  
BitsPerPel = 8  
30 XResolution = 800  
YResolution = 600

VRefresh = 60

AutoConfirm = 1

[Network]

5   InstallProtocols = Glaxo\_Protocol\_List

InstallInternetServer = Glaxo\_Internet\_List

**JoinDomain =**

**CreateComputerAccount =**

10   [Glaxo\_Protocol\_List]

TC = TCP/IP\_Parameters

[TCP/IP\_Parameters]

MCP=Yes

15

[Glaxo\_Internet\_List]

InstallNETSTP = 0

InstallMOSAIC = 0

20   The installation routine then modifies the copied script in dependence on the build location specific variables and on the delivery location specific variables (step 315) to create a dedicated installation script. In the above example, the script fields shown in bold are edited by inserting the delivery location specific variables, the field names corresponding to the column headings of Table 1. The unique identifier is entered as the ComputerName.

25

An entry in the dedicated installation script is made containing the workstation type code and each component code. These are later used during unattended installation to obtain and install additional operating system components necessary to best support the workstation type and installed components.

30

The computer operating system installation source is then copied from the network data store



onto the disk memory (such as a hard disk) of the computer workstation. The computer workstation variables are used to select additional software required by the detected computer type or detected hardware components, which are copied from the network data store.

- 5 The installation routine then proceeds in step 316 to accept inputs relating to the selection of additional software to be installed. Such additional software may include drivers to access other network protocols, office application suites and e-mail client software. The installation routine ends by running the Windows NT set-up routine held with the computer operating system source on the network store. The Windows NT set-up routine is run in step 317 in an  
10 unattended installation mode using the dedicated installation script to provide answers to questions usually asked during a manual set-up. The set-up routine proceeds substantially as has been described with reference to Figure 3.

Once the operating system has been substantially installed, the dedicated installation script  
15 then runs the installation routines for the additional software. In addition to hardware drivers needed to supplement the operating system to support particular hardware components, the additional software may also include software supplied by computer manufacturers tailored specifically for computer workstation types such as power management software, help files and maintenance software for the particular computer workstation model.

- 20 Windows NT requires that each computer workstation has its own DNS (Domain Name Service) address and that the address is registered with the network domain in which the computer workstation is to be used. With reference to the example of Figure 5, the configuration Step 206 of Figure 3 is expanded upon in the flow chart of Figure 6. Prior to the  
25 set-up routine ending, the routine reconnects the computer workstation to the network 10 using the newly installed computer operating system (step 412) and an attempt is made (step 414) to connect to the network where the computer workstation is intended to be used. If this is successful, the unique identifier for the computer is registered as the computer workstation's DNS address with the Windows NT network domain and server that the computer workstation  
30 is intended to be used upon in step 416. The computer workstation then disconnects from the network (step 418) and is ready for use upon delivery to the location where it is intended to

be used. If the attempt is not successful, the installation fails.

Where an outside organisation is contracted to supply and configure the computer workstation, a connection to the network where the computer workstation is intended to be used is not possible. To overcome this, a remote build site code relating to the outside organisation's own network is used for the build location code (REM in Table 1). In step 315 of Figure 5, when the copied script is modified, the location specific variables relating to the remote build site code are used for both the build location specific variables and the delivery location specific variables. The delivery location code entered is stored for later use. When an attempt is made to connect to the computer workstation to the network domain and server upon which the computer workstation is intended to be used (step 414), the connection is actually made to the remote build site network permitting the set-up routine to complete. When the computer workstation is delivered by the outside organisation to the delivery location, the configuration of the computer operating system is updated in dependence on the stored delivery location code. The unique identifier of the computer workstation is then registered with the Windows NT network domain and server that the computer workstation is intended to be used upon at the delivery location according to the previously described steps 414 to 418 of Figure 6.

Whilst in the above example the computer workstation's network interface device type is inputted by the installer, it is possible with new PCI type devices to automatically detect the network interface device from the BIOS in the same way as for other hardware components.

In addition to installing operating system supplements and software necessary to support hardware components and specific computer workstation types, it is also possible to change software based settings of the BIOS or for the hardware components once they have been identified from the BIOS. For example, the BIOS software itself may be out of date and may not support Year 2000 issues. As the BIOS software version is stored in the BIOS, this could be detected and the BIOS software updated or patched as a result.

Furthermore, it is well known that the default settings of some hardware components conflict

with others (such as network interface devices and modems) by attempting to use the same address or Interrupt. The installation routine can be set to identify these conflicts, due to knowledge of what standard hardware components a computer workstation of a certain type will have and/or detection of hardware components from the BIOS, and resolve them.

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Additionally, whilst most modems are not generally detectable, the installation routine can be pre-set with the knowledge that certain computer workstation types have modems by default and the operating system and additional software should be installed and configured to cater for this by including software for access to the internet, email, remote access etc.

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Although it would normally be expected that the additional software will be located with the operating system source on the remote computer, it may alternatively be located on a different source, on the same network or possibly accessible via the internet or an intranet.

- 15 Whilst the above description has been concerned with specific computer and computer hardware types, it will be apparent to the reader that the present invention is applicable to any PC-compatible computer system based on, for example the Intel Pentium chip architecture or the AMD PC chip architecture.

We claim:

1. A method of installing a computer operating system comprising:  
executing an installation routine on a computer, wherein the installation routine is  
5 adapted to accept user inputs defining a delivery location, and wherein the installation routine  
is adapted to detect a computer type,  
connecting the computer to an operating system installation source adapted to be held  
on a remote computer,  
retrieving a copy of a master installation script adapted to be held on the remote  
10 computer,  
modifying the copy of a master installation script in dependence on at least one  
variable associated with the delivery location and the computer type.  
creating a dedicated installation script, and  
auto-installing the computer operating system using the dedicated installation script.  
15
2. The method of claim 1, further comprising:  
installing software associated with the computer type in accordance with the dedicated  
installation script,  
wherein the installation routine is adapted to retrieve the software associated with the  
20 computer type from a remote source.
3. The method of claim 1, further comprising:  
retrieving software associated with the hardware components,  
supplementing the computer operating system from a remote source, and  
25 installing the software in accordance with the dedicated installation script,  
wherein the installation routine is adapted to detect hardware components of the  
computer.
4. The method of claim 2, wherein the remote source is the remote computer.
- 30 5. The method of claims 2, wherein the remote source is adapted to be accessible by

the internet.

6. The method of claim 3, wherein the installation routine is adapted to detect the hardware components of the computer by evaluating at least one of the computer's BIOS settings.

7. The method of claim 1, wherein the installation routine is adapted to detect the computer type by evaluating the computer's BIOS settings.

8. The method of claim 6, wherein the installation routine is adapted to evaluate at least one of the computer's BIOS settings by comparing at least one of the computer's BIOS settings with at least one predetermined BIOS setting.

9. The method of claim 8, wherein the storage device is adapted to store a database containing the predetermined BIOS settings, wherein at least one of the individual BIOS settings is associated with at least one of the hardware variables, and wherein at least one of the hardware variables is adapted to modify the master installation script.

10. The method of claim 9, further comprising:  
installing software for undetectable hardware components,  
wherein at least one of the hardware variables is adapted to modify the master installation script.

11. The method of claim 10, further comprising:  
changing at least one of the programmable settings of the computer or hardware component,  
wherein at least one of the hardware variables is adapted to modify the master installation script.

12. The method of claim 1, wherein the remote computer is adapted to be connected to a network.

13. The method of claim 12, wherein the installation routine is adapted to be initiated by running a computer program stored on a storage device.

5 14. The method of claim 13, wherein the storage device is a computer disk adapted to be inserted into a drive of the computer.

15. The method of claim 1, wherein the computer is adapted to connect to the remote computer by the internet.

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16. An comprising comprising:

a computer;

a network adapted to be connected to the computer;

15 a remote computer adapted to be connected to the network including an operating system installation source, software, and a master installation script file; and

a storage device adapted to store a set of computer executable instructions and at least one file for performing an installation routine.

17. The apparatus of claim 16, wherein the storage device is a computer disk.

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18. A computer-implemented article of manufacture for installing a computer operating system, the system comprising computer-executable instructions embodied in a computer-readable medium for performing steps comprising:

25 executing an installation routine on a computer, wherein the installation routine is adapted to accept user inputs defining a delivery location, and wherein the installation routine is adapted to detect a computer type,

connecting the computer to an operating system installation source adapted to be held on a remote computer,

30 retrieving a copy of a master installation script adapted to be held on the remote computer,

modifying the copy of a master installation script in dependence on at least one

variable associated with the delivery location and the computer type,  
creating a dedicated installation script, and  
auto-installing the computer operating system using the dedicated installation script.

- 5           19. The article of claim 18, wherein the machine is a general purpose computer.

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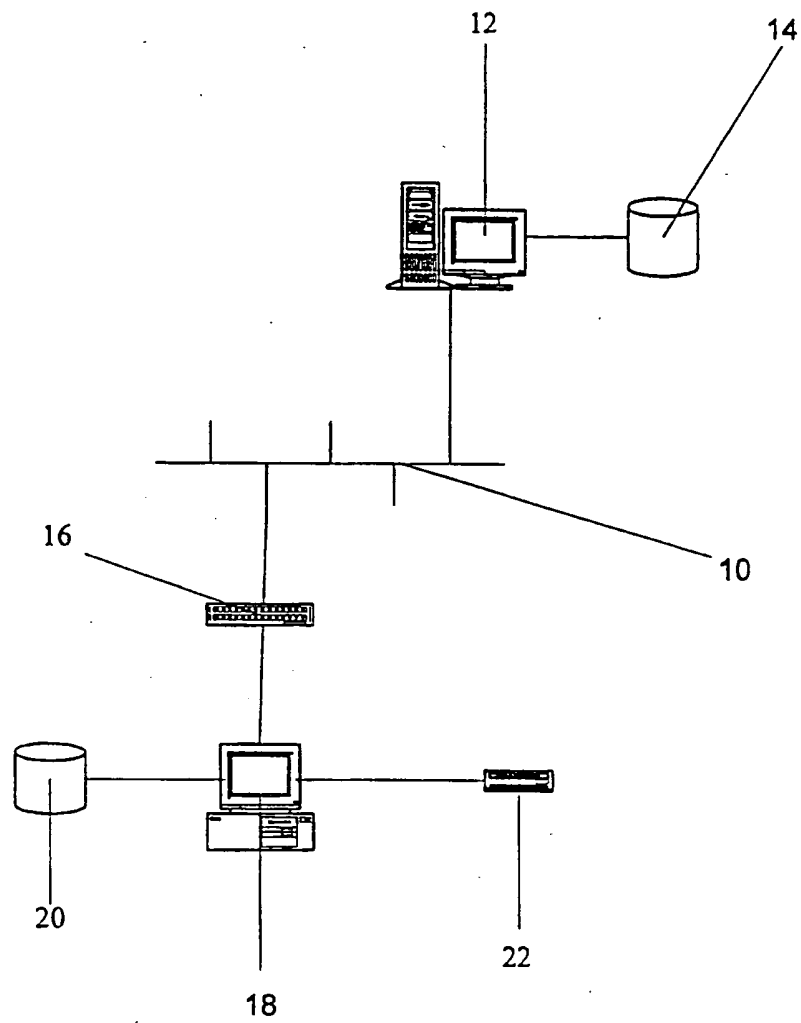
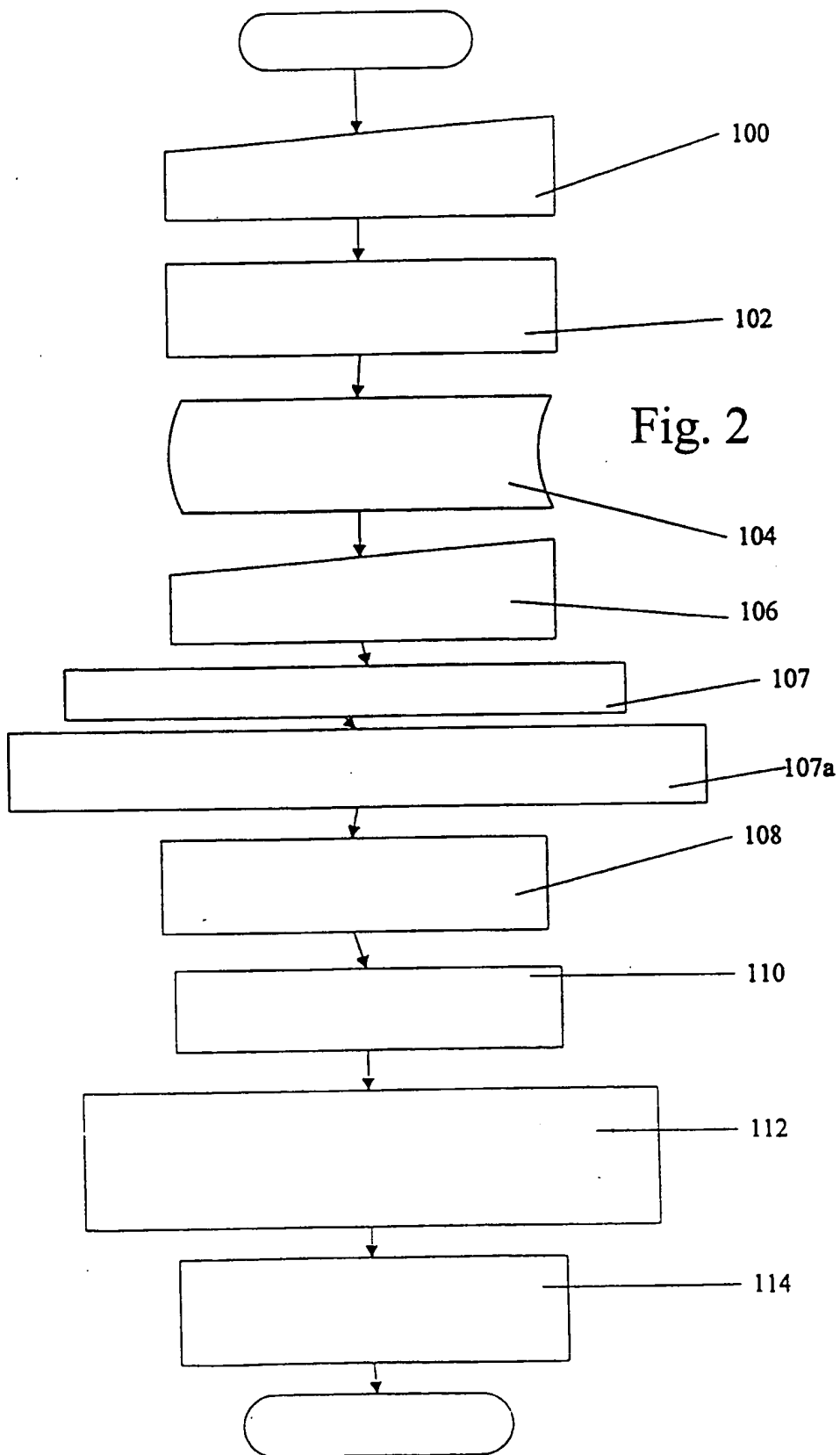


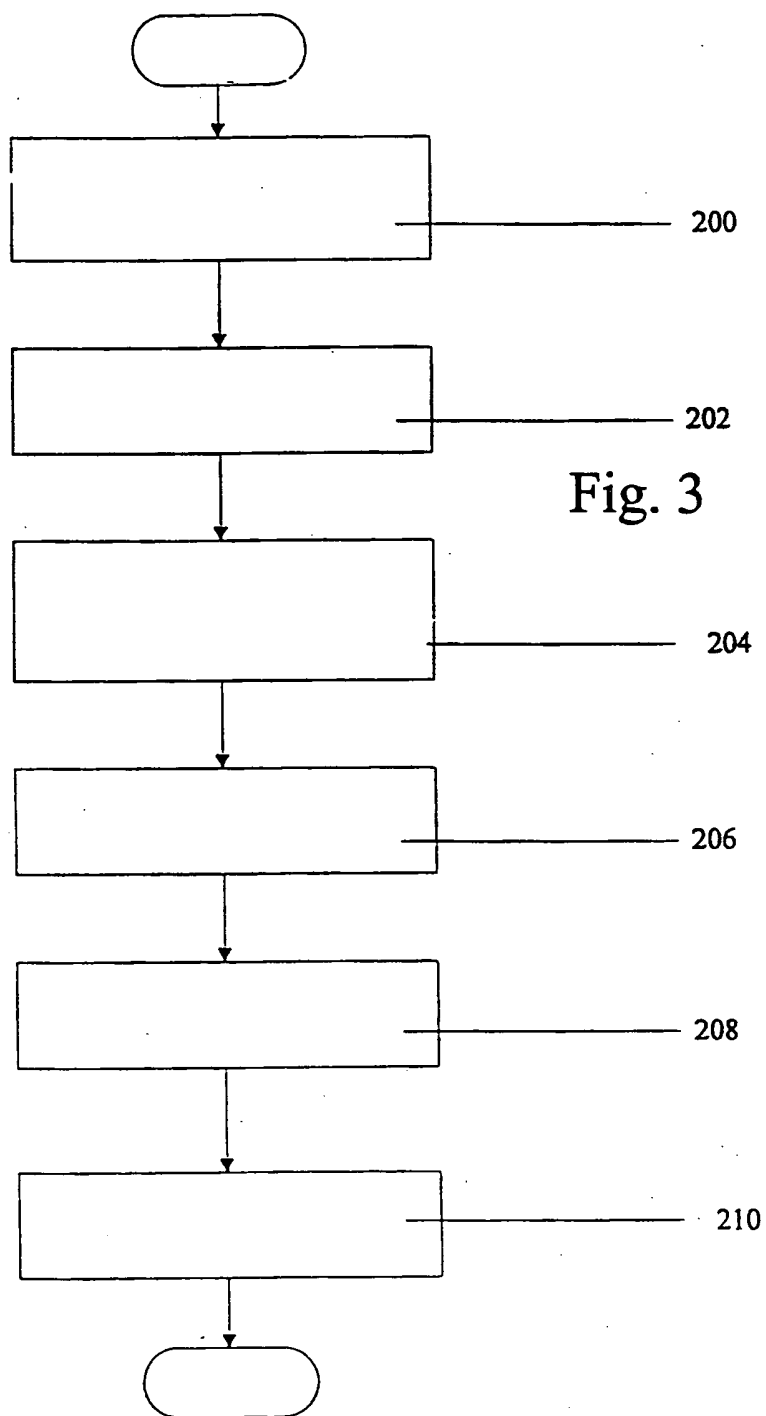
Fig. 1



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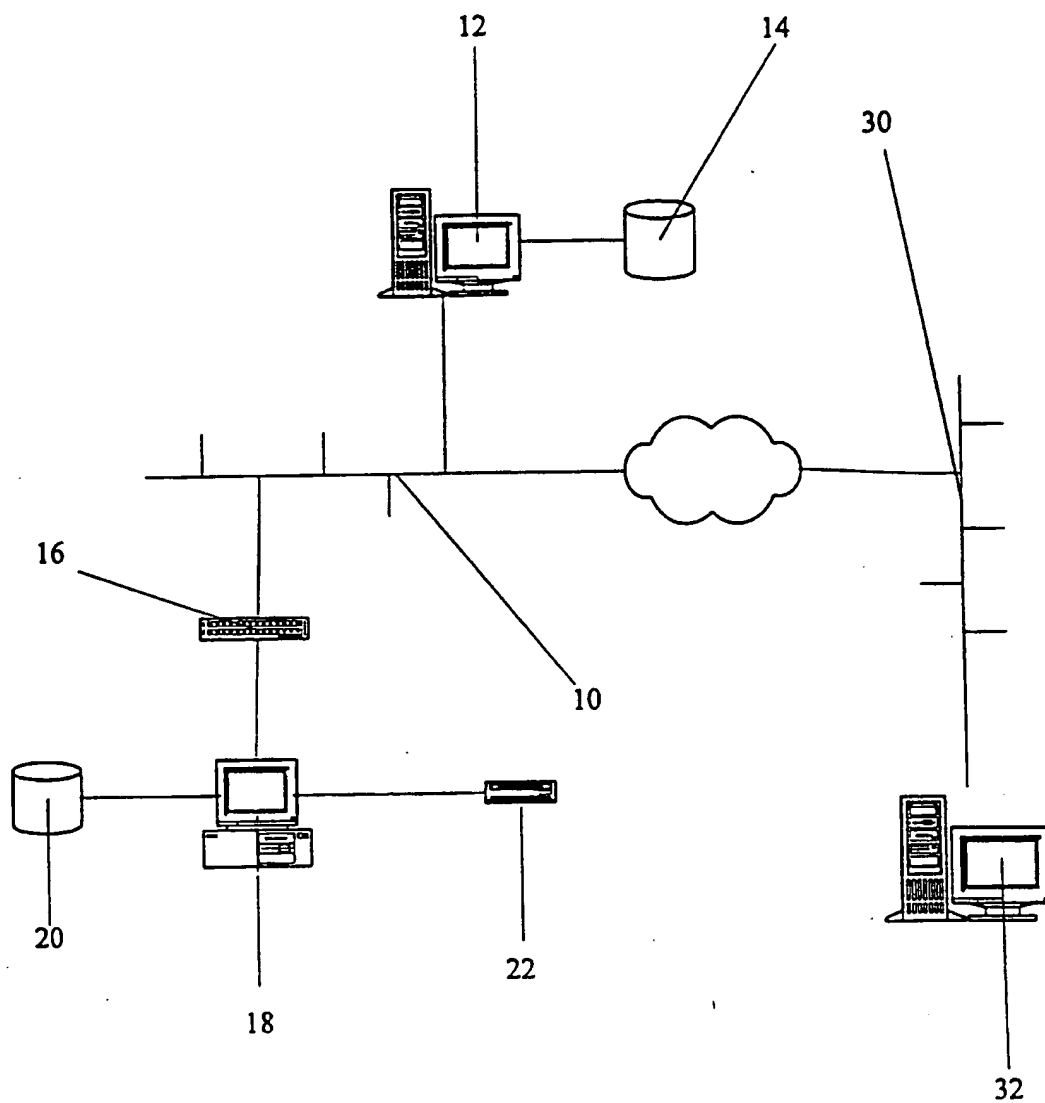
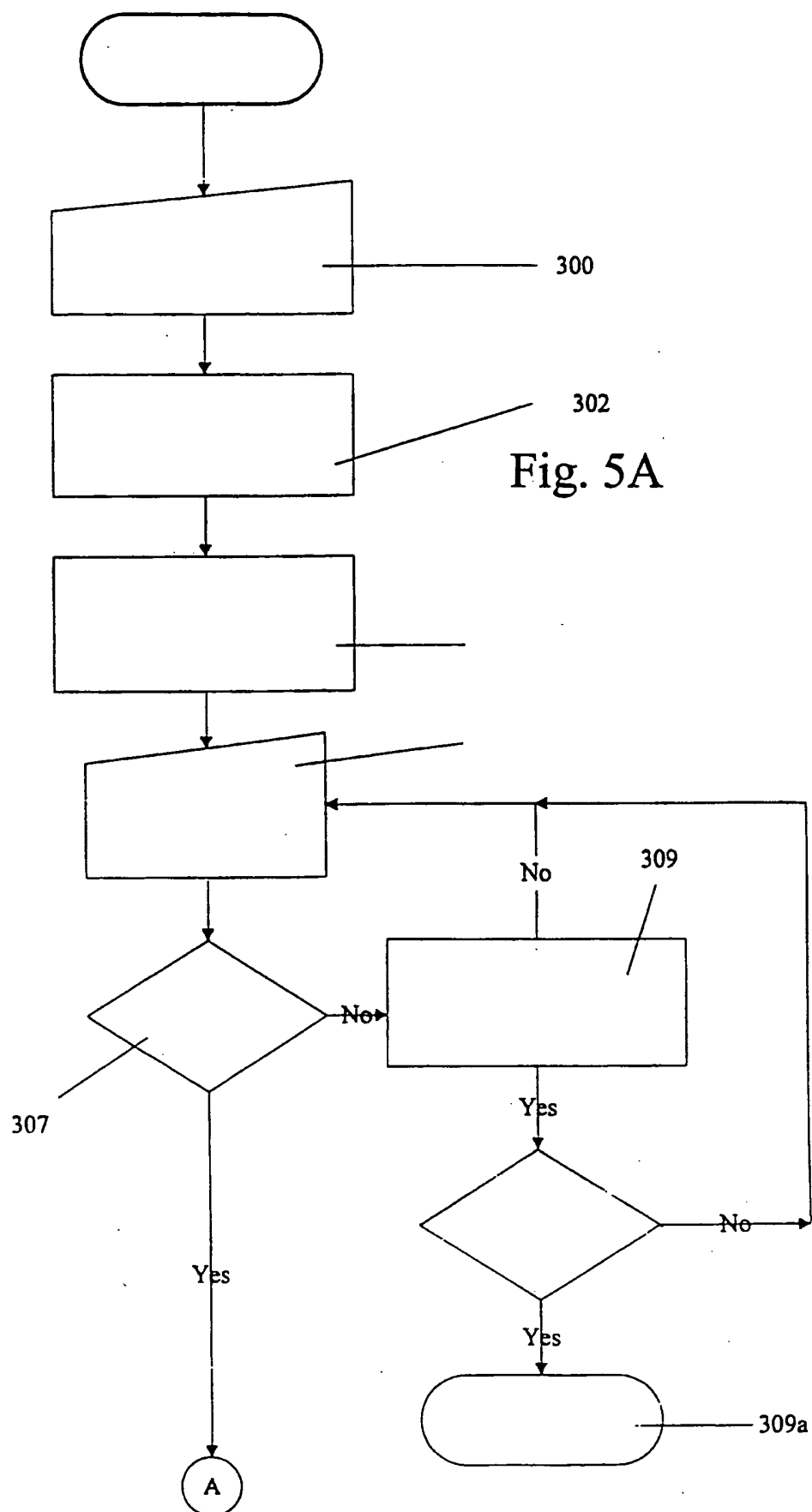


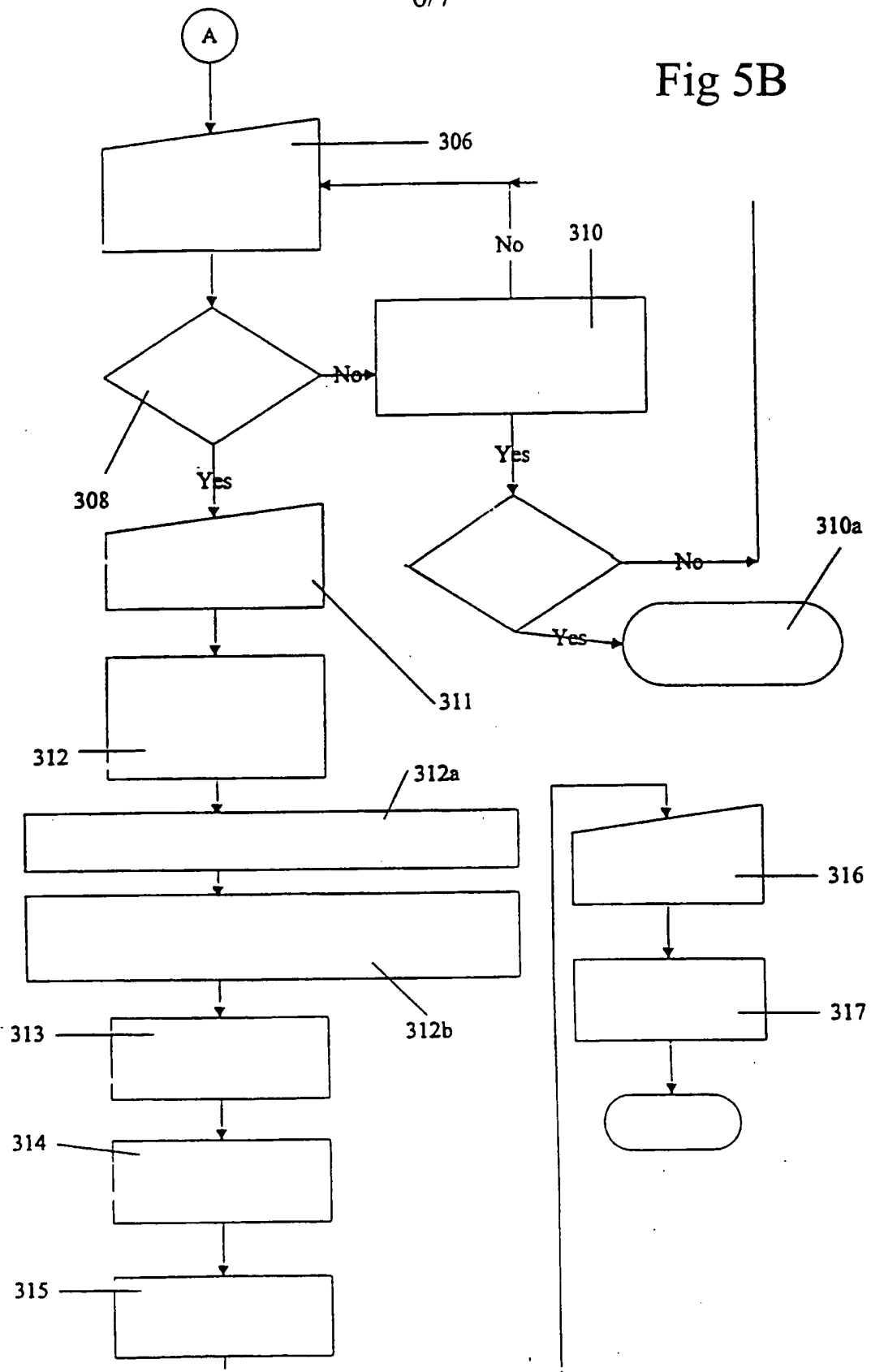
Fig. 4

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Fig 5B



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Fig 6

